WHAT IS CLAIMED IS:

1. A wavelength tunable laser comprising:

a semiconductor optical amplifier for emitting a laser beam;

a wavelength tunable filter arranged in an optical path of the laser beam;

a first optical filter arranged in the optical path of the laser beam and provided with a periodical transmissive wavelength;

two reflective members arranged so as to sandwich said semiconductor optical amplifier, said wavelength tunable filter, and said first optical filter, therebetween, said two reflective members being for resonating said laser beam;

a phase shifter for controlling a phase of the laser beam resonating between said reflective members;

a first unit to split light and a second unit to split light for splitting part of the laser beam passing through one of said reflective members;

a first optical detector for detecting an intensity of the laser beam split by said first unit to split light;

a second optical filter arranged in the optical path of the laser beam split by said second unit to split light and provided with a periodical transmissive wavelength; and

a second optical detector for detecting the intensity of the laser beam passing through said second optical filter,

wherein said phase shifter controls phase of the laser beam so that a ratio of the intensity detected by said second optical detector to the intensity detected by said first optical detector comes to a certain value.

2. The wavelength tunable laser according to claim 1,

wherein, of said two reflective members, one arranged at a side apart from said first and second units to split light and said wavelength tunable filter are composed of a same member.

3. The wavelength tunable laser according to claim 2,

wherein said member is a reflection-type filter using a diffraction grating.

4. The wavelength tunable laser according to claim 1,

wherein a free spectrum range of said first optical filter and a free spectrum range of said second optical filter coincide with each other.

5. The wavelength tunable laser according to claim 1,

wherein a free spectrum range of said second optical filter is a double of a free spectrum range of said first optical filter.

6. The wavelength tunable laser according to claim 1,

wherein said wavelength tunable filter is controlled so that the intensity of the laser beam detected by said first optical detector is maximized.

7. The wavelength tunable laser according to claim 1,

wherein said wavelength tunable filter is controlled so that a voltage applied to said semiconductor optical amplifier is minimized.

8. The wavelength tunable laser according to claim 3, further comprising a third optical detector for detecting the intensity of the beam passing through said reflection-type filter,

wherein a filter wavelength of said reflection-type filter is controlled so that the ratio of the optical intensity detected by said first optical detector to the optical intensity detected by the third optical detector comes to a given value.

9. The wavelength tunable laser according to claim 1, further comprising:

a third unit to split light for splitting part of the laser beam passing through one of said two reflective members;

a medium arranged in the optical path of the laser beam split by said third unit to split light, of which transmissibility changes modestly and monotonically with regard to a wavelength; and

a forth optical detector for detecting the intensity of the laser beam passing through said medium,

wherein an oscillation wavelength is identified based on the optical intensity detected by said fourth optical detector.

10. The wavelength tunable laser according to claim 1,

wherein a value calculated based in advance on a relation between phase of the laser beam resonating between said two reflective members and the intensity of the laser beam passing through one of said two reflective members is used as the certain value.

11. The wavelength tunable laser according to claim 1,

wherein said wavelength tunable laser has a phase range in which resonation in a same longitudinal mode is allowed, and

wherein the ratio of the intensity detected by said second optical detector to the intensity detected by said first optical detector when a center phase of the phase range is obtainable is used as the certain value.

12. The wavelength tunable laser according to claim 1,

wherein said first and second optical filters are etalons.

13. A method of controlling a wavelength tunable laser, said wavelength tunable laser including: a semiconductor optical amplifier for emitting a laser beam; a wavelength tunable filter arranged in an optical path of the laser beam; a first optical filter arranged in the optical path of the laser beam and provided with a periodical transmissive wavelength; two reflective members arranged so as to sandwich the semiconductor optical amplifier, the wavelength tunable filter, and the first optical filter, therebetween, the two reflective members being for resonating the laser beam; a phase shifter for controlling a phase of the laser beam resonating between the reflective members; a first unit to split light and a second unit to split light for splitting part of the laser beam passing through one of the reflective members; a first optical detector for detecting an intensity of the laser beam split by the first unit to split light; a second optical filter arranged in the optical path of the laser beam split by the second unit to split light and provided with a periodical transmissive wavelength; and a second optical detector for detecting the intensity of the laser beam passing through the second optical filter,

the method of controlling the wavelength tunable laser comprising the step of:

controlling phase of the laser beam resonating between the two reflective members so that a ratio of

the intensity detected by the second optical detector to the intensity detected by the first optical detector comes to a certain value.

14. The method of controlling the wavelength tunable laser according to claim 13, wherein the wavelength tunable filter is controlled so that the intensity detected by the first optical detector is maximized.

15. The method of controlling the wavelength tunable laser according to claim 13, wherein the wavelength tunable filter is controlled so that a voltage applied to the semiconductor optical amplifier is minimized.

16. The method of controlling the wavelength tunable laser according to claim 13,

wherein a value calculated in advance based on a relation between phase of the laser beam resonating between the two reflective members and the intensity of the laser beam passing through one of the two reflective members is used as the certain value.

17. The method of controlling the wavelength tunable laser according to claim 13,

wherein the wavelength tunable laser has a phase range in which resonation in a same longitudinal mode is allowed between the two reflective members, and

wherein the ratio of an intensity detected by the second optical detector to the intensity detected by the first optical detector when a central phase of

the phase range is obtainable is used as the certain value.